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Partial Motivation, Multiple Motivation: The Role of Output Schemas in Morphology



Geert Booij and Jenny Audring

Abstract Output-oriented, constructional schemas should be used for stating regularities that are not productive. These schemas have a motivational function only. We show that words may be partially motivated even when they lack a base word. Moreover, they can be motivated by more than one schema. This applies to the huge set of Dutch verbs in *-elen*. Verbs in *-eren* appear to exhibit similar properties, as do parallel verbs in German and English, and Dutch words ending in *-ig*. Diachronic facts, in particular the construction of nouns ending in *-er*, support the claim that language users make generalizations in the form of output-oriented schemas.

Keywords Diminutive verb · Motivation · Output schema · Phonaestheme · Productivity · Lexical network

1 Introduction

Morphological patterns, whether productive or unproductive, can be characterized by output schemas. If there is a systematic correspondence between form and meaning in a set of complex words, this systematic correspondence can be expressed by a constructional schema, as proposed in the framework of Construction Morphology (Booij 2010). For instance, the set of deadjectival nouns in German of the form $[A\text{-heit}]_N$, words such as *Schönheit* ‘beauty’ and *Wahrheit* ‘truth’ can be characterized by the following constructional schema:

(1) $\langle [A_i\text{-heit}]_{N_j} \leftrightarrow [\text{Property of SEM}_i]_{\text{SEM}_j} \rangle$

In this schema, the double arrow specifies correlations between the (phonological and morpho-syntactic) form and the meaning (SEM) of deadjectival nouns suffixed with *-heit*. The angled brackets demarcate the schema. Co-indexation specifies correlations between parts of the form and parts of the meaning. This constructional

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schema has two functions: on the one hand it specifies the predictable, systematic properties of existing, lexically stored nouns of this type. Thus, it indicates that the properties of these words are not completely arbitrary, but motivated. On the other hand, this schema specifies how new words of this type can be coined.

This approach to morphology is word-based rather than morpheme-based. The word is the basic unit of morphological analysis, and a complex word is not characterized as a concatenation of morphemes. Instead, morphemes are recurring pieces of words that can be identified on the basis of formal and semantic correspondences between sets of words. They are not always elements with a recurrent stable meaning (Aronoff 2013).

A classic argument for word-based morphology is that languages have lots of words that are formally complex, but lack a base word. For instance, as pointed out in Booij (1977: 29–33). Dutch has many prefixed verbs with a root that does not function as a word by itself, for instance verbs with the prefix *ont-*:

- (2) *ont-beer* ‘to lack’
ont-gin ‘to exploit’

These verbs have to be represented as complex because they behave as prefixed verbs morphologically. This can be seen in the way they form participles: Dutch past participles take the prefix *ge-*, unless the stem begins with an unstressed prefix. The past participles of the two verbs in (2) are *ont-beer-d* and *ont-gonn-en*, respectively, hence, they do behave as prefixed verbs. The root, *gin* of *ontginnen* which in itself is meaningless, shares properties with the equally meaningless element *gin* in the verb *beginnen* ‘to begin’: the past tense form and participle form of both verbs exhibit the same ablaut pattern: *ontgin* – *ontgon* – *ontgonnen*, *begin* – *begon* – *begonnen*. Hence, we want to say that the element *gin* is a formal component, in fact the same formal component, in both words.

The consequence of this observation is that although such verbs cannot be computed by means of concatenation of morphemes, they have to be stored as complex verbs in the lexicon.

In the Germanic languages we find lots of complex words, both prefixed and suffixed, for which there is no corresponding base word. In many cases this means that the base word has been lost, whereas the corresponding derived word has been preserved. This holds, for instance, for the following Dutch adjectives ending in the suffix *-loos*:

- (3) *arge-loos* ‘guileless’
roeke-loos ‘reckless’
weer-loos ‘defenseless’

In these words, the part *-loos* still contributes the meaning component ‘without’ which is also found for adjectives in *-loos* that do have a lexical base, such as *adem-loos* ‘breath-less’.

Other examples of such root-based morphology are found in geographical names. In English, for example, many toponyms end in a ‘town suffix’ like *-ton*, *-ford* or *-by* (as in *Hamilton*, *Hereford*, *Grimsby*), while the root is not in itself a word. Still, these endings make a word recognizable as a geographical name.

The phenomenon that individual complex words of a certain morphological type lack a corresponding base word is also found in the non-native stratum of the Dutch lexicon. Consider for instance the following nouns in *-ist*:

- (4) social-ist ‘socialist’
 Stalin-ist ‘Stalinist’
 aut-ist ‘autist’

These three nouns all denote a person with certain properties. The word *aut-ist*, however, has no base word, the root *aut-* is borrowed from Greek as part of the process of borrowing Greek words with that root. The regularity that all nouns in *-ist* denote persons can be expressed by the following schema:

- (5) $\langle [x \text{-ist}]_{N_j} \leftrightarrow [\text{Person with Property X}]_{SEM_j} \rangle$

These examples illustrate that there are lots of morphemes that do not have a meaning by themselves. Thus, they challenge the classical definition of the morpheme as the minimal meaning-bearing unit, and show the necessity of word-based instead of morpheme-based morphology (Booij 2010; Gundersen 2001). The meaning of complex words can better be defined over the entire word than over their individual morphemes.

In this paper we will focus on the analysis of certain types of root-based morphology. We will argue that constructional schemas should be used for stating regularities that are not productive. That is, some schemas may have a motivational function only. One of the cases we discuss is that of Dutch verbs ending in *-el*. Many of these verbs do not have a base that corresponds to an existing word. They have the form [root + *el*]. These verbs are semantically similar: they express an attenuative meaning (reduced intensity, i.e. diminutive, and often also iterative) that is linked to the appearance of the ending *-el* (phonological form /əɫ/). Some examples of such root-based verbs are the following, listed here in their infinitival form (stem + *-en*), which is the quotation form:

- (6) brabbelen ‘to babble’
 buitelen ‘to tumble’
 drentelen ‘to stroll’
 friemelen ‘to fiddle (with)’
 giechelen ‘to giggle’

The meaning of these verbs is PARTIALLY MOTIVATED: even though the roots have no meaning by themselves, the presence of the suffix *-el* indicates that these verbs can receive an attenuative interpretation. This motivation cannot be expressed in terms of a classic word-based word formation rule of the type proposed in Aronoff (1976). First, the base is not a lexical item that can be used in word formation.

Secondly, the pattern is not or only marginally productive, and hence, one cannot assume a rule, as such a rule would incorrectly generate new words of this type. Output schemas provide the right formalism to express such regularities: they capture the systematic form-meaning correspondence found in sets of established words, without automatically implying that the set can be extended. The output schema for verbs ending in *-el* with an attenuative and iterative interpretation has the following form:

(7) $\langle [x -el]_{Vi} \leftrightarrow [\text{Attenuated/Iterative Event}]_i \rangle$

In Sect. 2 we discuss the set of Dutch verbs in *-elen* in more detail. We show that such words are partially motivated even when they lack a base word. Moreover, we argue that they can be motivated by more than one schema. Verbs in *-eren* appear to exhibit similar properties (Sect. 3), as do parallel verbs in German and English (Sect. 4). In Sect. 5 we extend the analysis to words ending in *-ig*. Diachronic facts, in particular the construction of nouns ending in *-er*, support our claim that language users make generalizations in the form of output-oriented schemas (Sect. 6). Our theoretical conclusions concerning the importance of output schemas are summarized in Sect. 7.

2 The Motivation of Dutch Verbs in *-elen*

The *Van Dale dictionary of present-day Dutch* lists almost 300 simplex verbs ending in *-elen*. In addition, there is a substantial number of such verbs prefixed with *be-* or *ver-* such as *betuttelen* ‘to patronize’ or *vertroetelen* ‘to pamper’.¹ The *Woordenboek der Nederlandsche Taal*, a historical dictionary of Dutch, also lists a huge number of verbs ending in *-elen*, many obsolete by now, or from dialects, and many occurring in combination with a prefix or a particle. The largest collection, however, is De Jager (1875), a two-volume dictionary of “frequentatives”, i.e. verbs in *-elen* and *-eren* (for *-eren*, see Sect. 3 below).

According to *Schönfelds Historische Grammatica van het Nederlands* (Van Loey 1964: 237–238) the historical source of these verbs are nouns ending in the suffix *-el*, which were converted into verbs. This nominal suffix often contributed a diminutive meaning, as in *kruimel* ‘small crumb’ derived from *kruim* ‘crumb’. After conversion, the verb *kruimelen* ‘to crumble’ retained the diminutive semantics. Once formed, however, verbs in *-elen* could be reinterpreted as being derived from verbs rather than nouns. For instance, given the pair of verbs *druppen* ‘to drip’ and *druppelen* ‘to drip, to trickle’, converted from the nouns *drup* ‘drop’ and *druppel* ‘droplet’ respectively, the verb *druppelen* could be reinterpreted as being derived from the

¹As mentioned above, the infinitival form of Dutch verbs is the citation form, and hence, we will often present these verbs in this form. The verbal stem, without the infinitive suffix, ends in *-el*.

verb *druppen* directly. Thus, *-el* was reinterpreted as a deverbal suffix, and hence a verb like *trappelen* ‘to stamp’ could be derived directly from the verb *trappen* ‘to kick’ (there is no noun **trappel* that could have served as a nominal base).

According to Van Loey (1964), the verbal suffix *-el* acquired an iterative meaning, because this was a semantic characteristic of many of these verbs, whatever their derivational origin. This iterative suffix then also came to be used for the formation of new verbs of an onomatopoeic nature such as *rammelen* ‘to rumble’. This led to the emergence of a set of verbs in *-elen* that lack a lexical root.

A second source of root-based verbs in *-elen* is that for a number of verbs, their base words disappeared from the vocabulary of Dutch. For instance, the verb *wankelen* ‘to wobble’ was derived from the simplex verb *wanken* ‘to waver, to sway’, but subsequently *wanken* disappeared (it still exists in the neighbouring language German). Hence, in present-day Dutch, *wankelen* is a root-based verb.

From a synchronic point of view there are three classes of verbs in *-elen*:

- (I) Verbs derived from a nominal or verbal base word by means of *-el*: *kant* ‘side’-*kantelen* ‘to topple over’, *nest* ‘nest’ – *nestelen* ‘to nest’, *mengen* ‘to mix’-*mengelen* ‘to mix slightly’, *rijmen* ‘to rhyme’-*rijmelen* ‘to write bad verse’;
- (II) Root-based verbs in *-elen*; these verbs are root-based either due to the loss of the base word (*wankelen* ‘to wobble’), or due to onomatopoeic formation (*foezelen* ‘to tamper with’, *rammelen* ‘to rattle’).
- (III) Verbs derived by means of conversion from a noun or adjective ending in *-el*: *borstel* ‘brush’-*borstelen* ‘to brush’, *druppel* ‘drop’-*druppelen* ‘to drop’, *eikel* ‘acorn’-*eikelen* ‘to mess around’, *spiegel* ‘mirror’ – *spiegelen* ‘to reflect’, *dartel* ‘playful’-*dartelen* ‘to frolic about’. The sequence *el* is either part of the root (as in *spiegel*), or a suffix (as in *druppel*).

The same three types of verbs, with stems in *-el* and infinitive forms in *-el-n*, occur in German (and, indeed, in a similar form in English; see Sect. 4 below).

2.1 Type I and Type II Verbs

Weidhaas and Schmid (2015) present an analysis of German diminutive verbs and argue that their core meaning, in particular in cases that correspond to our type I and type II verbs, may be specified as ‘attenuation’. This implies meanings such as diminutive, i.e. less intensive, and iterative. The authors point out that there is a semantic connection between attenuation and iterativity: “rather than encoding a global and conclusive type of action, an ongoing, durative activity is conceptualized as consisting of smaller events that occur successively but have less force and intensity than the action proper” (Weidhaas and Schmid 2015: 201). This semantic characterization is also appropriate for many Dutch verbs in *-elen*, for instance:

(8) *Type I, with word as base (word-based)*

duikelen ‘to tumble’
 krabbelen ‘to scratch lightly’
 rijmelen ‘to write weak verse’
 hinkelen ‘to hop repeatedly’
 huppelen ‘to hop repeatedly’

brokkelen ‘to crumble’
 neuzelen ‘to twang’

Type II without word as base (root-based)

babbelen ‘to chat’
 biggelen ‘to trickle’
 brabbelen ‘to babble’
 drentelen ‘to saunter, to stroll’
 dribbelen ‘to dribble’
 dwarrelen ‘to swirl’
 frommelen ‘to crumple’
 gniffelen ‘to snigger’
 grabbelen ‘to scramble’
 kakelen ‘to cackle’
 knuffelen ‘to cuddle’
 kwebbelen ‘to chatter’
 murmelen ‘to gurgle’
 peddelen ‘to paddle’
 ritselen ‘to rustle’
 sabbelen ‘to suck’
 sprenkelen ‘to sprinkle’
 trippelen ‘to trip’
 wiebelen ‘to wobble’
 zwatelen ‘to buzz’

base = V

duik ‘to dive’
 krab ‘to scratch’
 rijm ‘to rhyme’
 hink ‘to limp’
 hup ‘to hop’

base = N

brok ‘piece’
 neus ‘nose’

While verbs in *-elen* express attenuation and iterativity, that is, repeated events (they are also referred to as frequentative verbs, e.g. in De Jager’s 1875 dictionary), it is obvious that the meaning of the type II verbs is only partially motivated, due to the lack of a base word. In this respect they differ from type I verbs. Yet, we want to express the fact that both classes of verbs denote a particular type of event. We can account for this partial motivation by schema (7), repeated with extensions in (9). The variable *x* stands for a sequence of phonemes, and *-el* is the suffix. The semantic property specified in the right-hand part of schema (7) is a property of the morphological construction as a whole: the constituent *-el* in itself does not carry that meaning, it only does so in words of the word class Verb.

This general schema dominates three subschemas: x can be a Root (in Type II verbs), a V, or an N (in Type I verbs). It is only when the part x corresponds to a word that a (sub)schema has the potential to be used for coining a new verb.

$$(9) \quad \begin{array}{c} <[x -el]_{Vi} \leftrightarrow [\text{Attenuated/Iterative Event}]_i > \\ | \qquad \qquad \qquad | \qquad \qquad \qquad | \\ <[\text{root-}el]_{Vi} \leftrightarrow [\text{Attenuated/Iterative Event}]_i > <[N-el]_{Vi} \leftrightarrow [\text{Attenuated/Iterative Event}]_i > <[V-el]_{Vi} \leftrightarrow [\text{Attenuated/Iterative Event}]_i > \end{array}$$

The existence of root-based words with a recurring, systematic meaning component is a strong argument in favour of morphological approaches which make use of output-oriented schemas, and argues against a conception of morphology as the ‘syntax of morphemes’. The roots are non-recurring residues after identification of *-el*, and they cannot be considered morphemes in the sense of minimal meaning-bearing units. This type of words reminds us of words with phonaesthemes. For instance, the ending *-owl* in English words may be associated with the meaning ‘sinister’, as in *owl*, *prowl*, *scowl*, *growl*, *howl* (Bolinger 1950: 123); however, the residue has no morphemic status. Kwon and Round (2015) discuss the status of phonaesthemes in linguistic theory, and come to the following conclusion: “any viable theory must find a place for lexical stems which are composed of a recurring, sound-meaning pairing plus a non-recurrent residue” (Kwon and Round 2015: 24).

The type of schemas we use here, within the framework of Construction Morphology, can be used for the description of phonaesthemes as well: the schema specifies the phonaestheme, and the variable x stands for the non-recurring residue. In short, output schemas for classes of words are also suitable for the description of phonaesthemic patterns. The difference between the verbs ending in *-el* and words with phonaesthemes is that *-el* is a recurrent constituent that also functions as a suffix in words that do have a recognizable base word, the type I verbs. Hence, recognition of the relevant pattern might be easier for verbs ending in *-elen*. The first subschema in (9) substantiates the claim that we may find a systematic form-meaning correspondence in a set of complex words without a base word.²

The semantic properties of type I and type II verbs are discussed in detail by Weidhaas and Schmid (2015) for the corresponding German verbs. They argue for the description of these semantics in terms of a semantic network à la Jurafsky (1996), which accounts for systematic polysemy patterns.

The individual verbs may have one or more than one related meanings as specified in this network. Weidhaas and Schmid (2015) point out that German verbs

²This does not mean that we can never form new verbs of this type. An example is the formation of the Dutch verb *ibbelen* ‘move your fingers through hair of a dog’ (Google search, August 4, 2016). This verb does not occur in dictionaries, and is apparently coined by some dog-lover, who has to explain its meaning on the internet site *Hondenforum*, a site for other dog-lovers.

in *-eln* do not always have the full range of specified meanings. This also applies to Dutch. For instance, the following Dutch verbs do not have the attenuative meaning, but do have an iterative meaning:

- (10) *wentelen* ‘to rotate’, *wisselen* ‘to change’

The following verbs have neither an attenuative or an iterative meaning:

- (11) *sneuelen* ‘to fall in battle’, *spijbelen* ‘to skip school’

In other words, verbs in *-elen* may differ in the degree to which they are motivated by schema (9).

This is accommodated by the model, as in CxM both abstract schemas and individual complex words are stored in the lexicon. Properties of an individual complex word that follow from a schema to which this word can be related count as redundant, or motivated. In this view, there is no opposition between a schema-based and an exemplar-based approach to the analysis of complex words, unlike what Weidhaas and Schmid (2015) suggest. They discuss a schema-based approach without the individual words being linked to schemas, and reject it in favour of an exemplar-based approach because individual words may differ from what the schemas predict. However, we feel this is a false opposition, as both individual complex words and the schemas that provide potential motivation for these words can be assumed to be stored in the lexicon.

2.2 *Type III Verbs*

Verbs in *-elen* can also be created by conversion of nouns ending in *-el* into verbs (Type III verbs). As noted above, this was – historically speaking – the primary source for *-el* verbs. Conversion of N to V is a productive process in Dutch. Here is a list of examples:

- (12) conversion of $[x -el]_N$ into verbs with iterative meaning

<i>noun</i>	<i>verb</i>
<i>borrel</i> ‘drink’	<i>borrelen</i> ‘to have a drink’
<i>borstel</i> ‘brush’	<i>borstelen</i> ‘to brush’
<i>buffel</i> ‘buffalo’	<i>buffelen</i> ‘to beaver away’
<i>cirkel</i> ‘circle’	<i>cirkelen</i> ‘to circle’
<i>hagel</i> ‘hail’	<i>hagelen</i> ‘to hail’
<i>lepel</i> ‘spoon’	<i>lepelen</i> ‘to spoon’
<i>pekkel</i> ‘salt’	<i>pekelen</i> ‘to put down salt’
<i>ratel</i> ‘rattle’	<i>ratelen</i> ‘to rattle’
<i>schommel</i> ‘swing’	<i>schommelen</i> ‘to swing’
<i>sleutel</i> ‘key’	<i>sleutelen</i> ‘to fiddle’
<i>stempel</i> ‘stamp’	<i>stempelen</i> ‘to stamp’
<i>trommel</i> ‘drum’	<i>trommelen</i> ‘to beat the drum’
<i>winkel</i> ‘shop’	<i>winkelen</i> ‘to shop’

These verbs do not have an attenuative meaning, but most of them have an iterative meaning. This iterative meaning does not follow from the conversion process as such, as there are lots of denominal conversion verbs in Dutch without such a meaning. These verbs denote an action in which the entity denoted by the corresponding noun is involved. For instance, the verb *fietsen* ‘to cycle’ corresponds with the noun *fiets* ‘bicycle’, and denotes the action of cycling. There is no specific meaning component of iterativity involved. In other words, it is a specific subclass of conversion verbs, those derived from nouns ending in *-el*, that appear to carry this iterative meaning. This generalization can be expressed by linking these verbs to the schema for type I and type II verbs, which often have an iterative meaning. This is expressed in schema (7), repeated here for convenience.

(7) $\langle [x -el]_{Vi} \leftrightarrow [\text{Attenuated/Iterative Event}]_i \rangle$

Verbs can carry both meanings at the same time. Hence the slash means ‘and/or’. This implies that the schema represents two subschemas, one for each meaning. The type III verbs that express an iterative meaning can now be linked to the subschema for ‘Iterative Event’.

This linkage implies that a complex word may receive its motivation from more than one schema. In this case, the verbs in (12) are motivated by the schema for denominal conversion (schema 13 below) and the schema for iterative verbs ending in *-el*. This is therefore a case of MULTIPLE MOTIVATION. Such cases are easily accounted for in an architecture that views the lexicon as a multidimensional network of relations between words and morphological schemas of various degrees of abstractness. Let us look again at a specific example. The verbs in (12) all express an action that is normally repeated. For instance, the verb *lepelen* denotes a repeated use of a spoon in order to bring a liquid into a container or food into one’s mouth. The verb is an instantiation of N-to-V conversion, and hence derives its motivation partially from the general meaning and structure of this schema. Conversion of N to V is a systematic paradigmatic relationship between nouns and verbs. This paradigmatic relation is specified by co-indexation of components of two different schemas, as specified in (13):

(13) $\langle [x_i]_N \leftrightarrow SEM_i \rangle$
 $\langle [x_i]_V \leftrightarrow [\text{Perform Action with } SEM_i \text{ being involved}]_{SEM_i} \rangle$

In Construction Morphology, we therefore assume that the lexical representation of the verb *lepelen* is linked to schema (13). At the same time, the verb *lepelen* can also be linked to schema (7), and be interpreted as an instantiation of that schema, since the phonological form of the stem of *lepelen* can be decomposed into */x-el/* and the word as a whole carries the word class label V. This illustrates that a word may be motivated by more than one morphological schema.

Interestingly, this does not exhaust the motivational connections of *lepelen*. The noun *lepel* itself contains an old proto-Germanic instrumental suffix *-el*, and there are a number of other instrument nouns in Dutch with this suffix, such as *beit-el*

‘chisel’, *schomm-el* ‘swing’, *stemp-el* ‘stamp’, *sleut-el* ‘key’ and *tromm-el* ‘drum’. Thus, the verb *lepelen* receives a third, indirect motivation through the following schema:

$$(14) \quad \langle [x -el]_{Ni} \leftrightarrow [\text{Instrument}]_{SEMi} \rangle$$

A similar situation arises with verbs whose nominal base is not an instrument noun, but a diminutive. Such nouns are formed with a variant of the nominal *-el* suffix in (14), which, however, has a diminutive meaning (schema 14’):

$$(14)' \quad \langle [x -el]_{Ni} \leftrightarrow [\text{Small Entity}]_{SEMi} \rangle$$

Instantiations of this schema are, for example, the nouns *kruim-el* ‘crumb’ and *eik-el* ‘acorn’. If converted, the resulting verbs have links to both the nominal and the verbal diminutive schema, as well as to the conversion schema. Multiple motivation of this type can lead to structural ambiguities, as will be discussed below.

Note again that motivation does not necessarily encompass all formal and semantic aspects of the verb. For example, the verb *cirkelen* ‘to move in a circle, to circle around’ is derived by conversion from the noun *cirkel* ‘circle’. The meaning of this verb is partially motivated by the meaning of the noun. Also, *cirkelen* is formally and semantically motivated by the N > V conversion schema specified in (13). At the same time, it has an iterative meaning and can thereby be related semantically to the *[x -el]* verbs schematized in (7). However, the noun *cirkel* cannot be linked to schema (14) as it does not denote an instrument; nor is it a diminutive noun. Hence, we see multiple motivation and partial motivation in the same word.

Consider also the verbs *sleutelen*, *stempelen*, and *trommelen*, all denoting activities in which the instrument is denoted by the base noun. Clearly, these verbs denote a repeated action, but not one of less intensity. Hence, it can be linked to subpart ‘Iterative Event’ of (7) only. Note that the iterativity of these verbs does not stem from a diminutive meaning of the nominal base, which would otherwise be a natural source.³

2.3 Structural Ambiguity

Patterns of multiple motivation can lead to variation among language users as to the structural connection among lexical items. The lexicons of individual language users differ, and hence also the range of possible links among complex words and between complex words and schemas. In the case of potential multiple motivation, language users may therefore differ as to which links they perceive between words.

³This does not mean that all type III verbs in *-elen* are iterative in nature. For instance, the verb *dieselen* ‘to use diesel oil’ has no obvious iterative meaning, although its meaning is related straightforwardly to that of the corresponding noun *diesel*.

In fact, words might be linked in ways that result in structural ambiguity. Consider the following set of words presented by De Haas and Trommelen (1993: 345):

- | | | | | | |
|------|-----------------------|-------------|-----------------------|-------------|---------------------|
| (15) | <i>simplex noun</i> > | <i>verb</i> | <i>derived noun</i> > | <i>verb</i> | <i>derived verb</i> |
| | drup | drupp-en | drupp-el | drupp-el-en | drupp-el-en |
| | kreuk | kreuk-en | kreuk-el | kreuk-el-en | kreuk-el-en |

As De Haas and Trommelen (1993) point out, the derived verbs may be morphologically related in various ways. The verb *druppelen*, for instance, may be a conversion of the noun *drupp-el* (a diminutive noun of the type discussed as (14') above), or a derivation by means of verbal *-el* from the verb *drupp-en*. In other words, this verb may be motivated by various constructional schemas, and neither the language user nor the morphologist has to decide which schema has to be selected. Instead of considering this an analytical problem for the morphologist, it is more appropriate to see these verbs as cases of multiple motivation. The verb *druppelen* shares the constituent *drup* with other words, and this constituent can be co-indexed with more than one other word in the lexicon:

- | | | | |
|-------------------|---|--|------|
| (16) ⁴ | [<i>drupp</i> _{j,k} - <i>el</i>] _{vi} | [<i>drup</i>] _j | Noun |
| | | [<i>drup</i>] _k | Verb |
| | | [<i>drupp</i> _j <i>el</i>] _i | Noun |

Moreover, [*drupp-el*] as a whole can be coindexed both with the verbal diminutive schema in (7) and the nominal diminutive schema in (14'), plus the conversion schema in (13). While these patterns are contradictory in derivational terms, they can easily coexist synchronically in a network of lexical links. This possibility of multiple co-indexation means that the semantic interpretation of the verb *druppelen* is strongly entrenched in the network of semantic relations between words in the lexicon. What we expect is that the more potential links a word has to morphologically related words and schemas, the easier it will be to retrieve the meaning and structure of that word.

A similar example is the verb *prikkelen* 'to prick, to stimulate' which may be either related to the noun *prik* 'prick', the verb stem *prik* 'to prick', or the noun *prikkel* 'prick, incentive'. Again, all options are available, and there is no need to single out one specific relationship as the correct or the only one.

A different flavour of ambiguity arises with a particularly interesting group of word pairs listed under (17).

⁴The double p is a spelling convention, there is only one /p/.

(17)	klungel-en ‘to bungle’	<>	klungel ‘awkward person’
	bikkel-en ‘to be tough’	<>	bikkel ‘tough person’
	sukkel-en ‘to ail, to plod’	<>	sukkel ‘wimp, plodder’
	stuntel-en ‘to be clumsy’	<>	stuntel ‘clumsy person’
	dreutel-en ‘to dawdle’	<>	dreutel ‘dawdler’
	griezel-en ‘to be creeped out’	<>	griezel ‘creepy person’

Here, the direction of conversion is indeterminable: the verbs could have been derived along the usual denominal conversion route, but the opposite direction is a true alternative. The relation between *-el* nouns and *-el* verbs is so well-established that it might allow for paradigmatic extensions, especially in clearly recognizable semantic niches (the word pairs (17) all denote persons and their behaviour). Again, we see multiple motivation at work (nominal *-el*, verbal *-el* and conversion), creating a tight network of related words.

Conceptually, the idea of multiple motivation fits in very well with the basic idea of Construction Morphology that morphological schemas are based on systematic relationships between sets of words in the lexicon. Sets of complex words that exhibit a certain systematic form-meaning correspondence give rise to morphological schemas. An individual listed complex word may fit into more than one schema, and hence its properties may be motivated in multiple ways. In other words, multiple motivation is to be expected in this view of the relationship between lexicon and morphology.

2.4 Complex Verbs

The verbs discussed so far are all simplex verbs. In Dutch dictionaries we also find a lot of these verbs with a prefix or a particle, for instance:

- (18)
- a with particle *af*
 - af-troggelen ‘to wheedle sth. out of sbd.’
 - af-wimpelen ‘to get rid of sbd.’
 - b. with prefix *be-*
 - be-disselen ‘arrange’
 - be-duimelen ‘to thumb’
 - be-potelen ‘to paw, to muddle’
 - c with prefix *ver-*
 - ver-haspelen ‘to mangle’
 - ver-nachelen ‘to cheat, to ruin’
 - ver-schrompelen ‘to shrivel’

These verbs have no corresponding independently existing base word. They do have the familiar iterative meaning component, and can be linked to schema (7). Moreover, each word is linked to the respective particle or prefix schema that

matches its structure. In the case of the prefixed verbs, these linkages account for the typical behaviour in past participle formation that we saw for the verbs in (2) above: the verbs under (18b, c) form their participles without *ge-*.

In sum, we have seen that there are recurrent meaning components in the large set of verbs in *-elen*. This makes these verbs partially motivated, which can be expressed by a schema that has a purely motivational function. In addition, we saw that the meaning of some of these verbs is also partially motivated by the N > V conversion schema and, in some cases, a schema with nominal *-el*. Thus, these verbs illustrate the idea of multiple motivation. In the next section we will see that Dutch verbs in *-eren* also exhibit both partial and multiple motivation.

3 Verbs in *-eren*

The classification of verbs ending in *-elen* also applies to verbs in *-eren*. From a synchronic point of view there are three types, parallel to the three types of verbs in *-elen* discussed in Sect. 2:

- (I) Verbs derived from a base word by means of *-er*: from a verb: *kiepen* ‘to tumble’- *kieperen* ‘to tumble (attenuative)’, *klappen* ‘to clap’- *klapperen* ‘to flapper’, *knippen* ‘to cut’ – *knipperen* ‘to blink, to flash’, *redden* ‘to save’- *redderen* ‘to tidy up’, or a noun: *klont* ‘lump’- *klonteren* ‘to clot’, *snot* ‘mucus’- *snotteren* ‘to snivel’, *bad* ‘bath’- *badderen* ‘to splash around in bath, to go splashy-splashy’;
- (II) Root-based verbs in *-eren*; these verbs are root-based either due to the loss of the base word (**wappen* – *wapperen* ‘to blow’), or due to onomatopoeic formation of the root (*klateren* ‘to splash’, *kletteren* ‘to rattle’, *knetteren* ‘to crackle’).
- (III) Verbs derived by means of conversion from a noun or adjective ending in *-er*: *hamer* ‘hammer’ – *hameren* ‘to hammer’, *honger* ‘hunger’- *hongereren* ‘to starve’, *kaffer* ‘blockhead’- *kafferen* ‘to shout at’, *offer* ‘sacrifice’ – *offeren* ‘to sacrifice’, or adjective: *minder* ‘less’- *minderen* ‘to reduce’, *somber* ‘sombre, gloomy’ – *somberen* ‘to be in a sombre mood’.

The meaning contribution of the suffix *-er* in type I and type II verbs is often iterative, similar to that of *-el*, and sometimes the aspect of attenuation is also present, as in *badderen*, *redderen*, *flikkeren* ‘to flicker’, *dobberen* ‘to float, to bob’ and *fladdereren* ‘to flutter’. This means we can posit schema (19), parallel to schema (7).

- (19) <[x -er]_{vi} ↔ [Attenuated/Iterative Event]_i>

The set of root-based verbs (type II) in Dutch ending in *-er* is quite large. Here are some examples:

- (20) banjeren ‘to pace up and down’, bibberen ‘to shiver’, daveren ‘to thunder’,
 denderen ‘to
 rumble’, flakkeren ‘to flicker’, flodderen ‘to flap’, flonkeren ‘to twinkle’,
 flubberen ‘to
 wobble’, fluisteren ‘to whisper’, gakkeren ‘to cackle’, glibberen ‘to slither’,
 glinsteren ‘to
 glitter’, glitteren ‘to glitter’, glunderen ‘to beam’, kletteren ‘to rattle’,
 kliederen ‘to make a
 mess’, knetteren ‘to crackle’, knisperen ‘to rustle’

The following verbs are type III verbs, that is, verbal conversions of nouns in *-er*. Their meaning is therefore related to the meaning of the corresponding nouns, as specified in (13), though idiosyncrasies occur. Yet, they can also be linked to a general schema for *-er* verbs because many of these verbs have an iterative and/or attenuative meaning, which may follow from the nature of the action in which the object denoted by the corresponding noun is involved:

(21)	<i>noun</i>	<i>verb</i>
	etter ‘pus’	etteren ‘to fester’
	hamer ‘hammer’	hameren ‘to hammer’
	hamster ‘hamster’	hamsteren ‘stock up, hoard’
	honger ‘hunger’	hongeren ‘to starve’
	huiver ‘shiver’	huiveren ‘to shiver’
	jammer ‘misery’	jammeren ‘to moan’
	kanker ‘cancer’	kankeren ‘to moan’
	kikker ‘frog’	kikkeren ‘hop around’
	klodder ‘clot’	klodderen ‘to mess around’
	liefhebber ‘lover, amateur’	liefhebben ‘to dabble in sth.’
	moker ‘sledge-hammer’	mokeren ‘to hammer heavily’
	modder ‘mud’	modderen ‘to mess around’
	nummer ‘number’	nummeren ‘to number’
	slinger ‘swing’	slingeren ‘to swing’
	snot ‘mucus’	snotteren ‘to snivel’
	spijker ‘nail’	spijkeren ‘to nail’
	toeter ‘horn’	toeteren ‘to hoot’
	voeder ‘fodder’	voederen ‘to feed animals’

These verbs denote repetitive actions inspired by the meaning of the base noun. This iterative meaning is confirmed, and hence strengthened by the meaning of the constructional schema (19). Therefore, we may consider these verbs as having multiple motivation.

4 Parallels Between Dutch, German and English

Cognates of the verbal affixes *-el* and *-er* occur throughout the Germanic languages, and German and English also have substantial numbers of verbs with these affixes. A few examples were noted in passing above, others are:

(22) German

flattern ‘to flutter’, lispeln ‘to lisp’, meckern ‘to nag’, menscheln ‘to show human weakness’,
nörgeln ‘to nag’, quengeln ‘to whine’, rieseln ‘to trickle (down)’, stottern ‘to stammer’, zittern ‘to shiver’

English

to dangle, to flatter, to hover, to mumble, to puzzle, to simmer, to sparkle, to slither

There are many parallels between the Dutch, German, and English verbs, both semantic and formal. First, we see the attenuative and iterative meanings typical of verbal diminutives. German has *köch-el-n* ‘to simmer’ as a less intensive and more repetitive variant of *koch-en* ‘to cook’; similarly, verbs such as *schneif-el-n* ‘to sniffle’ and *stich-el-n* ‘to tease’ have a diminutive and an iterative character. The same holds for English *spark-le*, which might be seen as an attenuated variant of *spark* or *flash* and which also denotes a repetitive action. In addition, both English and German have onomatopoeic forms, witness *to babble*, *to stutter*, *murmeln* ‘to mumble’ or *gackern* ‘to cackle’.

Second, we find the same three types introduced above:

(I) Verbs derived from a base word by means of *-el/-er*:

German: *zünd-el-n* ‘to play with fire < *zünden* (V) ‘to ignite, *schleck-er-n* ‘to eat sweets’ < *schleck-en* (V) ‘to lick, esp. ice cream’, *gift-el-n* ‘to spew (verbal venom) > *Gift* (N) ‘venom’, *wild-er-n* ‘to poach’ < *Wild* (N) ‘game’, *blöd-el-n* ‘to fool around’ < *blöd* (A) ‘dumb’⁵, *achteln* ‘to divide into eight parts’ < *acht* (Num) ‘eight’;

English: *suck-le* < *suck* (V), *waddle* < *wade* (V), *nestle* < *nest* (N), *speck-le* < *speck* (N); *patter* < *pat* (V)

(II) Root-based verbs in *-el/-er*:

German: *bimmeln* ‘to ring, *bibbern* ‘to shiver’, *hecheln* ‘to pant’;

English: *puzzle*, *fondle*, *gargle*, *clutter*, *glower*, *mutter*

(III) Verbs derived by means of conversion from a noun or adjective ending in *-el/-er*:

⁵To our knowledge, there are no deadjectival *-er* formations.

German: *klingeln* ‘to ring’ < *klingel* (N) ‘bell’, *fächern* ‘to fan’ < *Fächer* (N) ‘fan’, *dunkeln* ‘to darken’ < *dunkel* (A) ‘dark’;

English: *to saddle* < *saddle* (N), *to hammer* < *hammer* (N), *to lower* < *lower* (A)

Individual examples worth mentioning are the German prefixed verb *ver-scheiß-er-n* ‘to make a fool of sbd.’, based on the noun *Scheiß(e)* ‘shit’ and the particularly poetic *irrlight-er-n* ‘to move like a ghost light’, from *Irrlicht* ‘ghost light, fen fire’. English has incidental prefixed forms such as *be-dragg-le-d* and *dis-grunt-le-d*, mainly restricted to the participle form. A orthographic oddity is *swivel*, which has <el> rather than <le> (the same spelling is found in nouns such as *shovel* and *satchel*).

Notable differences between Dutch, English, and German are that the percentage of lexical bases is notably larger in German and dramatically smaller in English. This is probably due to the general conservativeness of German, which has retained a greater number of the words that served as a base for the diminutive, whereas English has lost most of them. That said, Weidhaas and Schmid (2015) overreport the lexical bases for German; the list in the appendix includes historical forms no longer known in present-day German (e.g. **risen*, **smeichen* and **strampen*, to mention just a few). The preponderance of non-lexical bases again reminds us that output schemas are better suited to account for the formal and semantic regularities of the diminutive verbs, as there is often no input form to derive a complex word from.

German has a small number of *-el* verbs with adjectival bases, such as *blöd-el-n* ‘fool around’, from *blöd* ‘silly’, *schwäch-el-n* ‘to be weak’ from *schwach* ‘weak’ or *kränk-el-n* ‘to be sick’ from *krank* ‘sick’ (though the archaic verb *kranken* ‘be sick’ is an alternative source).⁵ Another ambiguous case is *eifersücht-el-n*, which is either denominal (< *Eifersucht* ‘jealousy’) or deadjectival (< *eifersüchtig* ‘jealous’, under suffix deletion). Interestingly, German has a productive niche of *-el* verbs with numerals as base; an example is *vierteln* ‘to quarter, to divide into four parts’. Of course, the actual number of novel formations is limited by practical considerations: there is little call for a verb like *neunzehnteln* ‘to divide into nineteen parts’. Another subgroup of interest are *-el* verbs meaning ‘talk like a speaker of dialect x’: *sächselt* ‘talk in the Saxon dialect’, *schwäbels* ‘talk in the Swabian dialect’, *Berliners* ‘talk in the Berlin dialect’. This class is also mentioned in Weidhaas and Schmid (2015: 187).

German diminutive verbs sometimes show umlaut, as in the pairs in (23).

- (23) *kochen* ‘to cook’ *köcheln* ‘to simmer’
 lachen ‘to laugh’ *lächeln* ‘to smile’
 husten ‘to cough’ *hüsteln* ‘to cough slightly, to clear one’s throat’

Such pairs are rare in Dutch (an example would be *spatten* ‘to splash’ > *spetteren* ‘to splash’) and – to our knowledge – absent in English.

While the proposed classification generally works well for the three languages, the distinction between class I and class III words is sometimes difficult in English.

Consider the verb *to saddle*. Its semantics ('put a saddle on sth.')

reveals that it is a conversion of the noun *saddle*, which makes it a class III verb. The suffix is the nominal *-le*, a cognate of the instrument suffix described in Sect. 2.2 for Dutch. However, the direction of conversion is much less clear for words such as *bundle*, *handle*, *drizzle*, *chatter*, *shiver* or *shudder*, which also have homophonous nominal forms, but provide no synchronic indication of whether the noun is derived from the verb or vice versa. As English is particularly free in applying conversion, there are a number of ambiguous cases of this type. The structural ambiguity is often matched by semantic ambiguity: *drizzle* has a diminutive meaning that could be paraphrased both as "rain lightly" or "light precipitation", which would match the verbal *-el* or the nominal (diminutive) *-el*, respectively.

As we argued for Dutch, such cases represent instances of multiple motivation. A particularly illustrative case is *handle*. Historically, the noun *handle* contains the instrument suffix also described for *saddle*, while the verb is a cognate of German and Dutch *handeln/handelen* 'to trade' and contains a frequentative suffix (etymology by Oxford English Dictionary, consulted online on 12/2/2017). Currently, we see a verb with an iterative meaning, which links it to the verbal diminutives, and a homophonous noun in a connection of ambiguous directionality. Hence, the relation invokes both the schema for V-to-N conversion and the schema for N-to-V-conversion. For those speakers that have acquired a generalization for the nominal *-el* suffix, here in its instrument meaning, the noun is additionally motivated. Finally, both noun and verb are connected to the simplex nominal *hand*, and perhaps weakly to the homophonous verb. Hence, we see the multiple interrelations in the lexicon, involving both words and schemas. Similar examples can be found both in German and in Dutch.

With this note, we leave the diminutives for a moment to point out interesting parallels in other patterns of word formation.

5 Adjectives and Verb Stems in *-ig*

Dutch adjectives ending in *-ig* are similar to the verbs discussed in Sects. 2 and 3 in that some of them have a base word, usually a noun, whereas a number of these adjectives are root-based:

- (24) *adjectives with base noun*
- | | |
|----------------------|------------------|
| hand-ig 'handy' | < hand 'hand' |
| jeugd-ig 'youthful' | < jeugd 'youth' |
| kruid-ig 'spicy' | < kruid 'spice' |
| nijd-ig 'angry' | < nijd 'anger' |
| tijd-ig 'timely' | < tijd 'time' |
| strijd-ig 'contrary' | < strijd 'fight' |

root-based adjectives

behendig ‘skilful’, bondig ‘succinct’, huidig ‘present’, koddig ‘droll’,
 kribbig ‘grumpy’,
 schunnig ‘filthy’, slordig ‘sloppy’, snibbig ‘snappy’, veilig ‘safe’, welig
 ‘opulent’,
 vaardig ‘able’, zalig ‘heavenly’

The root-based adjectives receive a partial motivation from the fact that they all end in *-ig*. Hence, they are adjectives, and denote a property. This is expressed by the following schema:

$$(25) \quad \langle [x \text{-ig}]_{Ai} \leftrightarrow [\text{Property}]_{SEMi} \rangle$$

These adjectives in *-ig* also play a role in the following sets of related words, where adjectives in *-ig* correspond with a verbal stem of the same shape. The issue here is whether the verb stems in *-ig* are derived from the nouns by means of suffixation with a verbal suffix *-ig*, or from the adjectives in *-ig*, either by conversion or by prefixation. There are three subsets of verbs in *-ig*: denominal verbs (26), deadjectival verbs (27) and a set of verbs where both types of relation are possible (28):

(26)	<i>Noun</i>	<i>Adjective in -ig</i>	<i>Verb stem in -ig</i>
	eed ‘oath’		be-ed-ig ‘to swear in’
	hulde ‘homage’		huld-ig ‘to honor’
	schade ‘damage’		be-schad-ig ‘to damage’
(27)		veil-ig ‘safe’	be-veil-ig ‘to secure’
		zal-ig ‘heavenly’	zal-ig ‘to beatify’
(28)	eerbied ‘respect’	eerbied-ig ‘respectful’	eerbied-ig ‘to respect’
	genade ‘mercy’	genad-ig ‘merciful’	be-genad-ig ‘to pardon’
	heil ‘salvation’	heil-ig ‘holy’	ont-heil-ig ‘to desacrify’
	jeugd ‘youth’	jeugd-ig ‘youthful’	ver-jeugd-ig ‘to rejuvenate’
	moed ‘courage’	moed-ig ‘courageous’	be-moed-ig ‘to encourage’
			ont-moed-ig ‘to discourage’
	ootmoed ‘humility’	ootmoed-ig ‘humble’	ver-ootmoed-ig ‘to humble’
	vocht ‘moisture’	vocht-ig ‘damp’	be-vocht-ig ‘to make wet’
	wet ‘law’	wett-ig ‘legal’	wett-ig ‘to justify’
	schuld ‘guilt’	schuld-ig ‘guilty’	be-schuld-ig ‘to accuse’
			ver-ont-schuld-ig ‘to apologize’
	zonde ‘sin’	zond-ig ‘sinful’	zond-ig ‘to sin’

As we saw above, words may receive a partial motivation by being linked to a schema. In this case, the verbs in (28) can be linked to two schemas:

$$(29) \quad \begin{array}{l} \text{a} \quad \langle [[x]_{Ni}\text{-ig}]_{Vj} \leftrightarrow [\text{Action in which SEM}_i \text{ is involved}]_{SEMJ} \rangle \\ \text{b} \quad \langle [[x]_{AK}]_{Vj} \leftrightarrow [\text{Cause to be SEM}_k]_{SEMJ} \rangle \end{array}$$

As in the case of verbs in *-elen* and *-eren*, it is not necessary to make a choice: the verbs in (28) can receive multiple motivation, from both schemas (29).

6 Nouns in *-er*

Germanic languages feature an enormous number of deverbal and denominal nouns in *-er* denoting persons or instruments, or both, and with a number of other meanings as well. In other words, there is a lot of polysemy involved. In addition, we find numerous root-based nouns of this type, which lack an independent base word. They exhibit a similar range of meanings as the *-er*-nouns with a base. As Köpcke and Panther (2016) point out for German, this suggests that there is a general output-oriented schema for such nouns. In our notation, such a general schema for nouns with an “-er-Gestalt” would have the following form:

(30) $\langle [x\text{-er}]_{Ni} \leftrightarrow [\text{Person/Instrument}]_i \rangle$

This general schema will motivate both deverbal and denominal nouns in *-er*. In addition, other nouns in *-er*, without a base word and denoting a person, could be linked to this schema as well. To be sure, there are lots of nouns in *-er* that do not denote a person, but the number of person-denoting nouns of this type is quite large. Hence, it makes sense to assume that person-denoting root-based nouns receive partial motivation from this schema, which is strengthened by the high number of deverbal and denominal personal nouns ending in *-er*.

Examples of root-based nouns of this type in Dutch are words like the following:

(31) *kabouter* ‘gnome’, *priester* ‘priest’, *ridder* ‘knight’, *schilder* ‘painter’, *slager* ‘butcher’, *zigeuner* ‘gipsy’

The noun *ridder* derived from Middle Dutch *riddere* ‘horse rider’, but acquired a more general meaning. Historically, the noun *schilder* is a denominal noun with *schild* ‘coat of arms’ as its base; it acquired the general meaning ‘painter’ and has thus lost its semantic transparency, but the suffix *-er* is still recognizable. *Slager* is derived from an allomorph *slaag* of the verb *slaan* ‘hit’, but is also opaque in present-day Dutch.

There are diachronic indications that language users relate these nouns to schema (30). One is etymology: the form of some of these nouns has changed in the course of time. This may be seen as an effect of the structure $[x\text{-er}]$ being imposed on these words. Consider the etymological source of the following nouns:

- (32) *word* *etymological source*
 dokter Latin doctor
 kabouter Proto-Germanic kobolt
 kaffer Arabic kāfir ‘non-believer’
 nikker English nigger < negro
 priester Greek presbyter
 zigeuner Italian zingaro

These cases illustrate how a borrowed word is adapted in the borrowing language by means of a schema, in this case for person-denoting nouns. Another example of the imposition of this structure on person-denoting words is that the following Middle Dutch words that ended in *-e* changed into words ending in *-er*:

- (33) herde ‘shepherd’ > herder (compare German *Hirt(e)*)
 schenke ‘giver’ > schenker (compare German *Schenk*)
 schutte ‘shooter’ > schutter (compare German *Schütze*)

This latter change can be qualified as systematization, since it leads to a situation in which all person-denoting nouns have the same ending *-er*.

Imposition of this schema on words can also be observed in the addition of *-er* to acronyms that by themselves already denote persons. In this case, the meaning ‘person’ is evoked twice, by the last letter of the acronym, and by *-er*:

- (34) BN (Bekende Nederlander) ‘famous Dutchman’ > BN-er
 UD (Universitair Docent) ‘assistant professor’ > UD-er

This type of change is referred to as overcharacterization (Van Marle 1978), because the meaning component ‘person’ is expressed twice. We find this overcharacterization not only for acronyms, but also for nouns denoting inhabitants of certain geographical areas or members of religious orders:

- (35) Afrik-aan ‘African’ > Afrik-an-er
 Dominic-aan ‘Dominican’ > Dominic-an-er
 Francisc-aan ‘Franciscan’ > Francisc-an-er
 Karmel-iet ‘Carmelite’ > Karmel-iet-er
 Sodom-iet ‘Sodomite’ > Sodom-iet-er

The endings *-aan* and *-iet* already indicate the meaning ‘person’. Yet, the [x-er]_N schema for personal nouns is imposed on these words, with the effect of overcharacterization. Again, this shows the influence of schemas, which can attract new member words as they serve to increase the degree of motivation and coherence in the mental lexicon.

7 Conclusions

The data and analysis above provide confirmation of Bybee's (1995) network model of lexical organization, in which frequent patterns of phonological and/or semantic links among lexical representations reveal morphological structure. This model is not concerned about minimizing redundancy in the lexicon, and the metaphor of 'building up words from pieces' is not the business of grammatical machinery. The models of Construction Morphology, as developed in Booij (2010) and of Relational Morphology (Jackendoff and Audring 2016) provide a further articulation of these ideas concerning the structure of lexical knowledge.

Schemas are essential for expressing relations between output forms. These schemas cannot only be used for the description of form-meaning correspondences in productive morphological processes, but may also be used for the description of non-productive patterns of form-meaning correspondence. That is, there is regularity without productivity.

Since the starting point of language users in making morphological generalizations is a set of output forms, we expect that complex words may be motivated by links to more than one schema. Such motivation may be full, partial, or multiple. Since motivation is a declarative, not a procedural relation, it represents a natural situation in the Construction Morphology theory of lexical knowledge.

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